WASHINGTON STATE DEPARTMENT OF ECOLOGY

Focus

Fatigue

Sleep is a basic human need and lack of sleep leads to fatigue. Fatigue is the degradation of performance associated with the basic human need for sleep. Unfortunately, society tends to view fatigue and the need for sleep as weakness, leading to the modern 24-hour-a-day, just-in-time, jet-lagged, technological society that leaves many people in a fatigued state. The consequences of fatigue tend to reveal themselves in accidents that cut across all facets of society, including transportation systems.

Some of the more well-known cases of fatigue-related accidents in the maritime industry include the grounding of the tankers WORLD PRODIGY and EXXON VALDEZ. In Washington state, fatigue was a factor in a number of significant bunker spills. In 1995, a tow vessel operator literally fell asleep at the helm and grounded a barge.

There are many misconceptions about fatigue and the need to sleep, among them:

- "I know how tired I am." Wrong. Since fatigue impairs all mental functions (including perception), people consistently underestimate their levels of fatigue.
- "I've been awake this long before with no problem." Wrong. The body's natural sleep rhythms are complex and subject to a variety of factors. A "wide-awake" experience one time may be a painful lesson in fatigue the next.
- "If I drink coffee I'll stay awake with no problem." Wrong. Caffeine's effect is transient (3 to 4 hours), and those who drink caffinated beverages regularly get less of a stimulant effect over time. In addition, once the stimulant effects have worn off, you may have a "rebound effect" and be even more fatigued. Stimulants like caffeine also can decrease the quality of your sleep when you finally get the opportunity.

A number of fatigue-related effects have been identified: "Lapses" (failures to respond, slow response, inappropriate responses), performance consistency decreases, reaction time increases, mental error increases, memory and recall decreases, vigilance decreases, and risk-taking behavior increases. The insidious nature of fatigue is that, since all mental functions are affected, the ability to recognize and compensate for the effects is decreased.

Unfortunately, there may be no warning before onset of a lapse or sleep in a fatigued individual. When signs and symptoms do appear they may include forgetfulness, poor decision-making, "slacking off," poor communication, and fixation on a single task or decision.

Social interaction, such as conversation, tends to temporarily stimulate a fatigued individual, which can be misleading to a supervisor making important staffing decisions. It is necessary to understand the causes of fatigue to properly identify fatigued individuals

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whose sleep deprivation could compromise vessel safety and performance.

Fatigue comes from a variety of sources, but all relate to the need to sleep. Some common fatigue-inducers:

- Sleep disorders. There are a number of sleep disorders, but the most common (4 percent to 9 percent of the U.S. population) is something called sleep apnea. Apnea is the cessation of breathing during sleep. This causes a person to waken so breathing can resume. Snoring can be a symptom of apnea. If you are overweight and snore, you may be at risk for apnea.
- Jet-lag. When we cross time zones our internal clock is upset by the rapid change in daylight hours. This mismatch between normal sleep time and the sleep period in the new time zone can disrupt one's body until it has time to rest.
- Changes in work shifts. As with jet-lag, we are contradicting our body's normal cycle of wakefulness and sleep.
- Sleep deficit. Like a checking account we can debit our normal sleep account and build a "sleep debt." There is no way to replenish the account other than by sleeping.
- Drug and alcohol effects. Many drugs and alcohol have sedative effects on the body. Drugs and alcohol may also induce fatigue because they disrupt normal sleep patterns, reducing the quality and/or quantity of sleep.

There are a number of possible fatigue countermeasures to keep in mind.

- Make informed decisions about scheduling;— understand how schedules induce fatigue.
- Make sleep time "sacred" (don't let other activities intrude).
- Provide a good sleeping environment;— on ships, some experimenting has been done with bunk orientation.
- Consider sleep needs when making staffing decisions.
- Avoid short-staffing.
- Maintain total sleep time by whatever means possible. If you cannot get your accustomed sleep all at once, try to make time for a nap.
- Develop at-work napping strategies, where possible, to reduce fatigue.
- Use a team approach (i.e., bridge resource management), where possible, to prevent a single person's fatigue from impeding safety.
- Avoid sleep-disruptive and sleep-inducing drugs and alcohol.
- Provide sufficient time to adjust one's circadian rhythm before taking on safety-dependent duties (e.g., when a vessel master travels through multiple time zones to relieve another master).

For more information, including a copy of the Fatigue Resource Directory, contact:

Fatigue Countermeasures Program
NASA Ames Research Center
Mail Stop 262-4
Moffett Field, CA 94035-1000
Fax: (415) 604-2177

World Wide Web Site:
http://www-afo.arc.nasa.gov/zteam/

For more information on sleep disorders:

National Sleep Foundation
1367 Connecticut Ave. NW, Suite 200
Washington, D.C. 20036

And for a list of accredited sleep disorder centers and labs:

American Sleep Disorders Association (ASDA)
Attn: Gregory Mader
1610 Fourteenth St. NW, Suite 30
Rochester, MN 55901
e-mail: gmader@millcomm.com

Spill Prevention, Preparedness, and Response Program
Olympia Office, (360) 407-7455, Fax (360) 407-7288
Puget Sound Field Office, (206) 389-2431, Fax (206) 587-5195
Columbia River Field Office, (503) 229-6103, Fax (503) 229-6954

If you have special accommodation needs, contact Mariann Cook Andrews at (360) 407-7211 (voice) or (360) 407-6006 (TDD).